

Enter sample IDs and CFC concentrations on the Data&Results worksheet

For each sample, enter the salinity of the water (at the time of recharge), the recharge temperature, and the recharge elevation.

Make sure the atmospheric mixing ratios (i.e. the fractions of CFCs in dry air) are appropriate for the study area. The default values are for North America

If the default mixing ratios are not appropriate for your area, enter appropriate values on the AtmMixingRatios worksheet

The program will calculate the concentration of CFCs in air that would be in equilibrium with the sample at the temperature and elevation given.

The program then compares the equivalent air concentration with the atmospheric mixing ratios to estimate the recharge year.

Note: The atmospheric mixing ratio for CFC-11 began declining in 1994. As of 2001 it had dropped to about the same value it was in 1989.

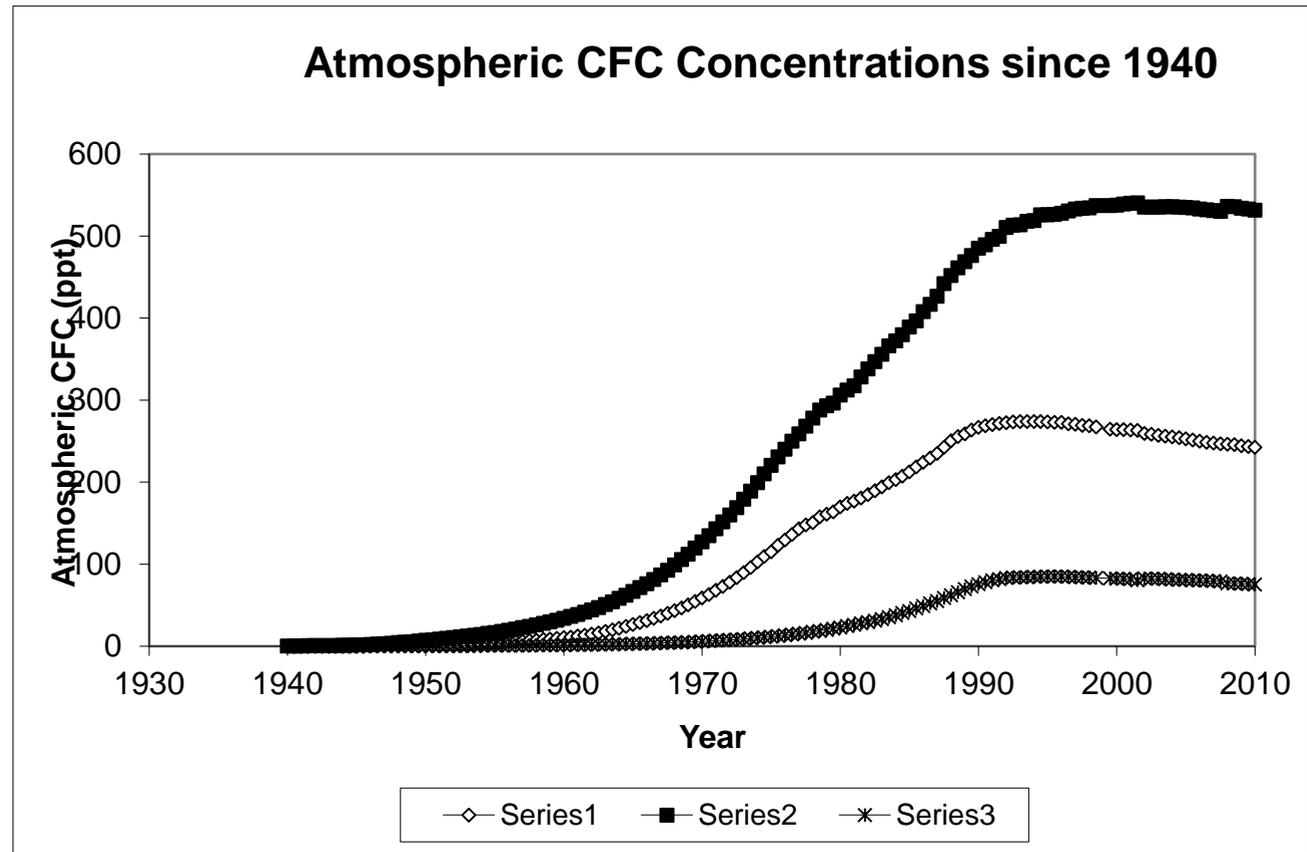
Thus, the CFC-11 dates are not unique for the period 1989 to 2001 (as of 2001). In other words, there are two possible years that correspond to the same concentration. When this occurs, this program will return the oldest of the two possible dates.

The same issue exists for CFC-113 starting in 1991.





Year	CFC-11.air	CFC-12.air	CFC-113.air
1940	0.01	0.33	0
1940.5	0.01	0.39	0
1941	0.02	0.47	0
1941.5	0.02	0.55	0
1942	0.02	0.65	0
1942.5	0.02	0.75	0
1943	0.03	0.87	0
1943.5	0.03	0.99	0.01
1944	0.04	1.16	0.01
1944.5	0.04	1.32	0.03
1945	0.05	1.53	0.04
1945.5	0.05	1.74	0.06
1946	0.07	2.12	0.08
1946.5	0.08	2.49	0.09
1947	0.11	3.06	0.11
1947.5	0.14	3.64	0.13
1948	0.2	4.3	0.15
1948.5	0.25	4.96	0.17
1949	0.34	5.67	0.2
1949.5	0.43	6.38	0.22
1950	0.56	7.16	0.25
1950.5	0.68	7.94	0.28
1951	0.86	8.79	0.31
1951.5	1.03	9.64	0.34
1952	1.29	10.5	0.38
1952.5	1.54	11.4	0.42
1953	1.89	12.4	0.45
1953.5	2.23	13.4	0.5
1954	2.66	14.5	0.54
1954.5	3.08	15.6	0.59
1955	3.6	16.9	0.64
1955.5	4.12	18.1	0.7
1956	4.77	19.6	0.76
1956.5	5.41	21	0.82
1957	6.13	22.7	0.89
1957.5	6.85	24.4	0.96
1958	7.51	26.1	1.04
1958.5	8.16	27.8	1.13
1959	8.82	29.7	1.21
1959.5	9.48	31.7	1.31
1960	10.4	34	1.41
1960.5	11.2	36.3	1.52
1961	12.4	38.8	1.63
1961.5	13.5	41.4	1.76



1962	15	44.4	1.89
1962.5	16.4	47.3	2.03
1963	18.1	50.8	2.18
1963.5	19.9	54.2	2.35
1964	22	58.3	2.52
1964.5	24.1	62.3	2.71
1965	26.4	66.8	2.9
1965.5	28.8	71.4	3.12
1966	31.4	76.4	3.34
1966.5	34	81.4	3.59
1967	37	87.1	3.84
1967.5	40	92.8	4.13
1968	43.3	99.1	4.41
1968.5	46.7	105.5	4.74
1969	50.6	112.5	5.07
1969.5	54.5	119.6	5.45
1970	58.9	127.3	5.83
1970.5	63.3	135	6.26
1971	68.1	143.2	6.69
1971.5	72.9	151.4	7.18
1972	78.3	160.3	7.68
1972.5	83.8	169.2	8.25
1973	89.9	179.1	8.81
1973.5	96.1	189	9.46
1974	102.9	199.6	10.1
1974.5	109.6	210.3	10.9
1975	115.3	220.4	11.6
1975.5	122.9	230.6	12.5
1976	129.8	240.3	13.3
1976.5	136	249.9	14.3
1977	143	259	15.3
1977.5	147.7	268.1	16.4
1978	150.9	277.9	17.5
1978.5	157.5	288.1	18.8
1979	160.8	293.3	20.1
1979.5	163.7	296.3	21.5
1980	169.7	306.2	23
1980.5	173.9	312.3	24.6
1981	177.1	317.5	26.2
1981.5	180.9	328.4	27.8
1982	185	338.1	29.5
1982.5	189.6	347	31.3
1983	194.5	355.8	33.1
1983.5	199.3	366.2	35.4
1984	203.2	372.5	37.7

1984.5	207.4	380	40.4
1985	212.6	389	43.1
1985.5	218.7	396.8	46
1986	224.4	407.9	48.9
1986.5	229.4	416.6	52.1
1987	235	426.6	55.2
1987.5	242.6	442.1	58.8
1988	250.3	452.1	62.3
1988.5	255.6	461.5	66.1
1989	259.1	469	69.8
1989.5	263.7	476.2	72.8
1990	266.8	485	75.9
1990.5	268.8	489.5	78
1991	270.4	496	80.2
1991.5	271.7	499.9	81.8
1992	272.7	510.7	83.4
1992.5	273.4	513.1	83.9
1993	273.8	513.7	84.1
1993.5	274.1	518.1	84.3
1994	274.1	519	84.6
1994.5	273.9	525.8	84.7
1995	273.5	526.2	84.9
1995.5	273	526.5	85.2
1996	272.9	527.7	85
1996.5	271.3	530.5	84.7
1997	270.5	533	84.4
1997.5	269.2	534	84.1
1998	268.8	534.4	83.8
1998.5	267.2	537.2	83.4
1999.5	264.4	537.3	82.8
2000	264.3	537.6	82.5
2000.5	263.9	539.3	82.2
2001	263.7	540	81.9
2001.5	263.2	540.3	80.6
2002	259.6	535.6	82.8
2002.5	258.3	535.3	82.4
2003	257.3	535.5	82.1
2003.5	256.0	535.8	81.7
2004	255.0	535.7	81.4
2004.5	254.1	535.3	81.0
2005	252.9	534.8	80.8
2005.5	251.6	534.3	80.3
2006	250.2	532.8	80.3
2006.5	248.7	532.0	79.8
2007	247.6	531.0	79.5

2007.5	246.6	530.2	79.1
2008	246.4	536.4	76.8
2008.5	245.8	535.6	76.5
2009	244.3	534.1	76.4
2009.5	243.6	533.0	75.6
2010	242.7	531.7	75.2
2010.5	241.5	530.2	74.9
2011	240.4	528.6	74.8
2011.5	239.5	527.5	74.4
2012	238.4	525.8	74.4
2012.5	237.3	524.2	73.8
2013	236.1	523.0	73.5
2013.5	235.6	522.0	72.8

KA1_11	KA2_11	KA3_11
-136.2685	206.115	57.2805
KB1_11	KB2_11	KB3_11
-0.148598	0.095114	-0.0163396

KA1_12	KA2_12	KA3_12
-124.4395	185.4299	51.6383
KB1_12	KB2_12	KB3_12
-0.149779	0.094668	-0.0160043

KA1_113	KA2_113	KA3_113
-136.129	206.475	55.8957
KB1_113	KB2_113	KB3_113
-0.02754	0.006033	0